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would have been of no use to these ancient swimmers. The possession of bony skeletons by all the Teleostei shows that this adaptation is a valuable one. Modern Sharks and Ganoids, while often cartilaginous, frequently possess completely ossified vertebræ. Thus we have reason to believe that the absence of internal bone in the most ancient fishes came from the fact that the conditions for the secretion of such bone had not yet been developed.

This leads to one further conclusion. Though a cartilaginous basis of muscular attachment might suffice for large swimming animals, it would not answer for large forms of terrestrial life. In these a greater rigidity was necessary. Therefore land vertebrates of large size could not appear until after the power of forming a bony skeleton had been attained. And it is significant that shortly after the appearance of bone in fish skeletons the Batrachians make their appearance in the rocks. We know that the land had been adapted for animal life for long ages before, and peopled by insects and scorpions, and possibly by forms of life of which we have no comprehension. It is very probable that fishes had long used the land as a temporary place of residence and feeding-ground. This we may safely infer from the existence of fossil Dipnoi, with their powers of breathing air or water at will. Yet it was impossible that large land vertebrates could appear until the bone-making power was fully developed. *Archægosaurus* one of the earliest air-breathers, possessed but a ring of bone in its vertebræ, like the Carboniferous Ganoids. But in all the remaining Carboniferous Batrachians a fully ossified skeleton appears, and this has been ever since an absolute requisite of all land vertebral life, and of all ocean vertebrates except a few survivals of the antique types.

Thus we reach the general conclusions that fossilization of animal forms was not possible until, after a long period of evolution, the power of secreting hard external coverings was gained; and that the existence of large land vertebrates was not possible until, after a still longer period of evolution, the power of secreting internal bony skeletons was developed. If these conclusions be well founded, many of the conditions of early life must remain forever unknown to us, and we cannot hope to recover more than a fragment of the antique fauna.

APRIL 14.

The President, Dr. LEIDY, in the chair.

Thirty-one persons present.

A paper entitled "Notes on Mesozoic Cockroaches," by Samuel H. Scudder, was presented for publication.

Washington city, he often sees such curled leaves suspended conspicuously amid the verdureless branches, and had learned to recognize them easily as the winter-quarters of this species. It of course follows that, either from purpose or by the accidental unwrapping of the threads during continual journeys back and forth trailing her drag-line behind her, the spider prevents the leaf from falling.

A vast colony of *Epeira vulgaris* inhabits the boat-houses grouped around the inlet wharf at Atlantic City. Dr. McCook stated that he had once visited this colony, May 22, 1882. The season had been a remarkably backward one, cold, and very rainy. The trees on the island had not yet leaved; insect life had scarcely appeared; in short the season had advanced little further than the first of May in ordinary years. The inlet colony, however, had already appeared in large numbers, and had swung their orbs between the timbers of the houses and the piles which supported them. These were of various sizes, full-grown, half-grown, and young several weeks out of the cocoons. All the cocoons—which were thickly laid along the angles of the joists and cornices—were empty. The number of young spiders was, however, remarkably small, a fact which he could account for only on the supposition that in the absence of the usual insect food supply, the adults had been driven to prey upon the young and the young upon each other to an unusual degree. Many of the spiders were hanging in the centre of their round snares. Others—the greater part, indeed—were sheltered within a thick tubular or arched screen, open at both ends, which was bent in the angles of the woodwork, or beneath an irregular rectangular silken patch stretched across a corner.

Many others were burrowed behind cocoons, quite covered up by the thick flossy fibre of which these are composed. In this condition they had undoubtedly spent the winter. He had found examples of *E. strix* blanketed in precisely the same way during the winter months. Unfortunately he had never been able to make a mid-winter journey to this favorite spider-haunt, in order to see the araneads in extreme hibernation; but he asked some of the young boatmen what the spiders did in winter-time. "They crawl into their bags," one answered, referring to the screens and tubes above described, "and stay there. They came out about a month ago (the last of April), and then 'shed.' A couple of weeks ago the sides of the houses were all covered with these 'sheds'"—by which, of course, the young man meant their moults.

The following was ordered to be printed:—